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ABSTRACT

This paper describes the use of video to provide a screenplay depiction of a proposed artificial intelligence software system. Advantages of such use are identified: (1) the video can be used to provide a clear conceptualization of the proposed system; (2) it can illustrate abstract technical concepts; (3) it can simulate the functions of the hardware and software systems without having to invest time and money in developing an expensive prototype; and (4) the enactment permits software developers to "test" whether the proposed system will meet users' needs, and modify the system design where necessary. (EW)

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The Use of Video Technology for the Fast-prototyping of Artificially Intelligent Software.

by
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How do you provide people with the look and feel of proposed, complex, sophisticated software without the time and expense of developing an actual working model? We do this by way of a videotaped enactment of our concept of the system. Each enactment is a detailed representation of a proposed system, but in the enactment all of the action is scripted. Actors and the computer are saying and displaying their lines on cue. Because these enactments are scripted and do not present working models, they more properly should be called mock-ups, not prototypes. I will explain the reason for the misnomer in the title later.

This approach of using video production improves communication both within a project development team, as well as throughout the user community. This improvement comes from: 1) the structure provided by the process of developing a detailed screenplay; 2) the ability to visually illustrate complex abstract technical concepts; 3) the ability to inexpensively simulate expensive technology, and, 4) the ease of distribution of this material on videotape. In addition, this approach facilitates designing the interface between the user and the computer at the beginning of the development cycle, which should greatly enhance the success of a project.

The Dallas County Community College District's umbrella program for the integration of computer technology into instruction is called the Systematic Augmentation of General Education (SAGE). One component of the SAGE program is the development, at the District level, of sophisticated software using artificial intelligence (AI) technology. AI technology enables a computer to emulate intelligent human behavior such as complex classifying, diagnosing, planning and remediating.

The scarcity of such advanced software has provided the opportunity and impetus for the DCCCD to form a joint venture with Data General Corporation to develop an expert system and an intelligent tutoring system. But this scarcity also creates a problem: how to provide people with the look and feel of this state-of-the art software when none is available for demonstration. Our solution is to use our video expertise to create videotaped scripted enactments of what such systems could look like.

The process of developing the screenplay provides an excellent structure for developing a clear conceptualization of the projected system. The conceptualization stage of developing an AI system is one of sharing knowledge between the subject matter (domain) expert(s) and the AI specialist(s). In artificial intelligence jargon this is called "knowledge acquisition." Indeed, a primary technique for knowledge acquisition is probing the domain expert with a scenario: "If this situation occurred, what would you do next?"

The screenplay provides an easily understood format for recording ideas, and it leaves little room for fuzzy ideas. Action and dialog must be detailed. All the elements in the picture must be described including the computer screen display, the peripherals attached, the mode of interaction (e.g., mouse, keyboard, touch screen). In describing all of these elements, it is natural

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as well as necessary to discuss the rationale for each of these elements. These rationale can also be incorporated into the screenplay in the form of dialogue or voice-over explanation.

In our case, the conceptualization process also has been enhanced by the addition of our video personnel to the development team. We have found that the production of telecourses involves much of the same knowledge acquisition processes as building an AI system. (Now, after developing a screenplay myself, that is obvious.) Thus, the involvement of the video producer and director not only made for good video, but also enhanced the conceptual clarification.

The explanation of complex concepts also can be aided by video techniques. For example, a screenplay for a future enactment of an intelligent tutoring system includes an animated segment to explain the normally unseen intercommunication between the major parts of the system. The screenplay calls for the segment to show four animated gremlins commenting back and forth on a student's last action. Their comments reflect their areas of expertise: communications, modeling, tutoring and subject matter. Their comments are instantly reflected on a blackboard for all to see ("blackboarding" is in fact an AI communication technique). Thus, we are able to visually illustrate this normally internal computer processing.

Because most people have never seen an AI system before, being able to visually illustrate even the overt actions of such systems greatly improves audience understanding of the underlying processes of these systems. It is well known that people tend to attribute any observed event to underlying processes. This tendency is so strong that all of the audiences who have seen our video enactments, even having been told these are just enactments, talk of these systems as real, asking questions like, "Can it also provide explanations in other languages?". Even one of our actors once began pressing the non-functioning "touch screen" buttons during a break, forgetting that the software was really controlled by a hidden keyboard.

We use this tendency by consciously structuring the screenplay so that the actions reflect the processes we are trying to explain, and the voice- over script enhances this effect further by discussing these processes as if they really are happening. The other side of this phenomenon is that it is essential in the development of the screenplay to be very clear about these underlying processes. It is like method-acting: the developers must understand why the computer should behave the way it does in the screenplay in order to ensure this behavior is realistic.

. Through the magic of video, we can simulate the functioning of expensive hardware or software. For example, we created two enactments of proposed expert systems: one of a system for matching students to available services and one of a system for non-verbally analyzing reading/thinking skills. The expected population of clients for both systems dictated that we would need an interface that would be quick to learn and easy to use. Touch screens fit the bill. We were able to simulate touch screen interaction by having our actors touch the screen while an off-camera operator actually controlled the software with a keyboard. The effect is very convincing without the cost of touch screen hardware or the cost of developing touch screen controlling software.

We also wanted to illustrate a very sophisticated example of the self- explanation capability of expert systems. We, of course, simply scripted a dialog between the actor and computer that illustrated this. Writing a program to actually do it extemporaneously would require very sophisticated programming, very expensive tools and a lot of time.

Although not videotaped, I presented at the 1987 League for Innovation in the Community College conference a re-enactment of the Lisp Tutor developed by John R. Anderson. The actual system requires very powerful hardware and is quite expensive, but with my live re-enactment, I could illustrate the actions and concepts of such a system. To illustrate how realistic these enactments can be, I did not tell my audience of its bogus nature at first. The discussion indicated that most thought my scripted interaction with the computer was spontaneous and this led to a lively discussion about the capabilities of intelligent tutoring systems.

Obviously, through the magic of video or film it is possible to illustrate things that are even beyond the realm of current technical capabilities. That is why it is essential that these enactments are developed by the complete computer project team, and that all of their expertise be used to enact only what is technically feasible.

The enactments allow us, at an early stage in the development process, to quickly, economically, visually and dramatically present the development team's conceptualization of the system(s) needed to meet the user community's requirements. They therefore allow us to find out where we may have missed the mark, from the user community, while we are still capable of easily changing our aim. This is much easier with such enactments as opposed to discussing AI concepts in the abstract or demonstrating them with systems from other domains.

In the case of our expert system enactments, the student support services community recommended that we development, over the next 12 months, the expert system to identify high-risk students. However, after seeing it enacted, they decided that the computer-based, interactive method we illustrated for collecting data from students was of secondary importance to the analytical capabilities illustrated. So, our first version probably will work in the background (batch mode), analyzing student data which probably will continue to be gathered as it is gathered now.

Finally, let me explain the use of the term fast-prototyping when our enactments are really mock-ups. In hardware engineering, a prototype is an actual working model of the planned development. It may be scaled down or missing some parts -- but it works. On the other hand, a mock-up, like our enactments, provides the look and feel of the final product but is not actually operational. Unfortunately, this distinction has been lost on many people in software engineering. So, I merely followed the now common mis- usage of the term fast-prototyping in my title.

Our videotaped enactments have provided us with an excellent way to improve communication regarding the complex, sophisticated software we are developing. This process will become a standard part of the DCCCD's development repertoire.